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To: Patty Hickman Director Division of Land Restoration

From: Ed McComas CEM Environmental Toxicologist

Date: January 30, 2017

Subject: West Virginia State University Human Health and Exposure Evaluation Review

WVDEP OER/DLR committee members met on January 17, 2017 to review The Mahfood Group (TMG) West Virginia State University (WVSU) Human Health Exposure Evaluation (HHEE). Based on discussion with the committee, TMG did an excellent job of compiling, organizing and illustrating findings of various EnviroProbe and CH2M Hill environmental investigative reports identified in the WVDEP Work Directive.

The TMG HHEE screened available data from those reports using United States Environmental Protection Agency (USEPA) criteria with target carcinogenic risk of 1×10^{-06} and non-carcinogenic risk of 0.1 hazard quotient. This approach resulted in a conservative/protective analysis. TMG developed groundwater, soil gas, vapor intrusion (VI) and constituents of concern (COC) data tables from EnviroProbe and CH2M Hill reports/figures, screened at applicable USEPA human health benchmarks and provided COC results, data gaps, summaries, etc. It should be noted that these benchmarks are based on 24 hours/day, 350 days/year for 26-year exposure assumptions for residential vapor intrusion screening levels (VISL) and 8 hours/day, 250 days/year and 25 years for staff/commercial workers. A more likely upper bound exposure scenario for student or resident faculty exposure assumptions would be 18 hours/day, 270 days/year for 4-5 years, and therefore, indoor air exposure results for temporary residents/students/faculty living in dorms or temporary housing on campus would be significantly less (5 or 8 times less) than residential COC VISL.

Section 4 Data Gap Analysis, noted several issues e.g., lack of surface/subsurface soil data that could have been used to: identify alternate COC sources, evaluate the direct contact pathway (incidental ingestion, dermal, etc.) and evaluate impacts of soil migration to groundwater, soil gas, indoor air, etc. Additionally, only 3 of 40 buildings onsite were fully evaluated for VI (although Faculty Housing evaluation likely represented worst case for on-site residential exposure since being closest to GW plume). EnviroProbe conducted a soil gas screening investigation for the Northern Area of campus away from the groundwater plume and other previous vapor intrusion investigation. These soil gas sample locations appear to target on-site buildings including dormitories (Dawson Hall and Judge Keith Scholars (JKS) Hall) and student gathering areas (Quad and Student Union). No other media/lines of evidence e.g., groundwater,

sub-slab soil gas, indoor air, crawlspace or ambient air sample data were included for this area. Soil gas COC exceeded either residential or commercial 1 x 10^{-06}, or in one instance, residential 1 x 10^{-05} carcinogenic target risk and 0.1 non-carcinogenic target hazard quotient (HQ) for areas surrounding these buildings. No potential COC VI source was identified in this investigation. Based on the nature of COC (benzene, naphthalene - petroleum based) and USEPA and Interstate Technology and Regulatory Council (ITRC) VI guidance for petroleum products, it is likely COC would biodegrade and attenuate to levels below the target carcinogenic risk of 1 x 10^{-06} and non-carcinogenic target HQ of 0.1 where there is at least 5 or 6 feet of clean soil above the COC source. This would not apply to buildings with basements.

Groundwater sample results including the Eastern Area (downgradient of the Institute Plant) indicated several COC exceeding either the residential or commercial 1 x 10^{-06} VISL carcinogenic target risk or 0.1 non-carcinogenic HQ, or both. In all cases, the IA sampling data indicated the IA results were within acceptable levels which take precedence.

There was also disparity in results e.g., EnviroProbe exterior soil gas samples had unusually consistent results for benzene across all vapor probe samples and cover a wide area without identifiable potential VI sources, etc.

In cases where exterior soil gas VISL were exceeded, indoor air results were given precedence and thus, quantitative evaluation was deemed not necessary. Where indoor air and ambient air sample results were similar, similar rational was applied.

Based on the comprehensive VI surveys of the 3 onsite buildings including the Faculty Housing (possibly worst case scenario for on-site residential exposure) it does not appear that VI poses a significant risk to students, faculty or staff at WVSU. For the Northern Area of campus where only an exterior soil gas screening investigation was conducted, there is insufficient sampling data/lines of evidence to determine risk for students, faculty and staff residing or working in these buildings. It would be necessary to conduct additional vapor intrusion investigation for these areas to complete the conceptual site model and comprehensive human health exposure evaluation. Based on limited groundwater sampling data and other lines of evidence from the Eastern, Faculty Housing, Convocation Center and Athletic Facility Areas, there does not appear to be a potentially significant VI source originating from the groundwater plume migrating from the Union Carbide Corporation (UCC) Institute Site.

Please don't hesitate to call should you have questions concerning the WVSU HHEE report.